CS110 Introduction to Computing
Fall 2016
Practice Exam 1 -- Solutions

The exam will be closed-note and closed-book; please consider this fact before using your notes on this practice version. Please see the abbreviated Processing reference at the back of this exam.

This exam is intended to be taken in 80 minutes.

Assume that any given Processing statements do not have typographical errors. Aim for all code to be syntactically correct, but missing semi-colons (for example) will not be penalized.

Question 1 (10 points) Circle/write the correct answer in each of the following:

a) Which of the following is **not** one of the shape drawing commands in Processing:

```
1. quad(…)
2. triangle(…)
3. circle(…)
4. point(…)
```

b) What would Processing do as a result of this statement?
```
line(width, 0, 0, height);
```

   Draw a line from the top-right corner to the bottom-left corner of the sketch

c) Consider the following function:

```
void enigma(int k) {
   int answer = 0;
   if (k < 10) {
      if (k < 15) {
         answer = 1;
      }
      else {
         answer = 2;
      }
   }
   else if (k < 15) {
         answer = 3;
   }
   else {
         answer = 4;
   }
   println(answer);
}
```
For what argument values k does enigma(k) print the value 2?

```
1. enigma(k) will never print 2 for any value of k
2. k < 10
3. 10 <= k < 15
4. k >=15
```

d) How many times would this code print the text "Hello"?

```
for (int i = 10; i >= 2; i-=2) {
    println("Hello");
}
```

   5

e) What is the value of x after the following statements are evaluated?
```
int y = 0, z = 1;
boolean x = (y >= 0 && z < 0);
```

   false

f) Suppose that the variable x currently has the value 10. What statement would cause the value of x to become 13?

```
1. x + 3;
2. y = x + 3;
3. x = x + 3;
4.  None. The value of x can't be changed.
```

g) What is the result of evaluating `9/2`?

   4

h) What is the result of evaluating `9%2`?

   1

i) What does the following code print?

```
float x = 2/9;
println(x);
```

   0.0

j) What does the following code print?
```
float x = 9/2.0;
println(x);
```

   4.5

Question 2 (5 points)

Write Processing statements to draw a red rectangle covering the right half of the sketch. Your statements should work for any sketch size.

```
fill(255, 0, 0);
rect(width / 2, 0, width / 2, height);
```

Question 3 (5 points)

Write a conditional expression that would print "teenager" whenever an integer variable age has a value between 13 and 19, inclusive.

```
int age = …;
// write your conditional here:

if(age >= 13 && age <= 19)
{
    println("teenager");
}

// or the following:

if(age >= 13)
{
    if(age <= 19)
    {
        println("teenager");
    }
}
```

Question 4 (15 points)

The following Processing program is supposed to draw a blue circle of random diameter in the range 20 to 50 pixels centered on every mouse click. Complete the program by writing the appropriate commands needed to accomplish the task.

```
void setup() {
   size(400, 400);
   background(255);
}

void draw() { }

void mousePressed()
{
     float size = random(20, 50);
     ellipse(mouseX, mouseY, size, size);
}
```

Question 5 (15 points)

a) Rewrite the following code, using a while-loop instead of a for-loop. The results of executing the two code fragments should be identical.

```
int num = 6;
for(int i=10; i > 0; i-=2){
      println(num);
      num -= i;
}
```

```
int num = 6;
int i = 10;
while(i > 0)
{
      println(num);
      num -= i;
      i -= 2;
}
```

b) What is printed by the code fragment in 5(a) above?

```
6
-4
-12
-18
-22
```

Question 6 (15 points)

Write a Processing function that plays a simplified version of the Bizz/Buzz game. To do this, your code should print out consecutive numbers (starting at the parameter `start` and ending at `end`). Whenever a number is divisible by 5, it should print `"Bizz"` instead of the number. Whenever a number is divisible by 7, it should print `"Buzz"` instead of the number. Whenever a number is divisible by both 5 and 7, it should print `"BizzBuzz"` instead of the number.

(Note: The non-simplified version of the game also has special behavior when the digit 5 or 7 appears in the number. You do not have to worry about this part of the game.)

Remember that the `%` operator in Processing computes the modulus – that is, the remainder after dividing one integer by another.

```
void bizzBuzz(int start, int end)
{
    for(int i = start; i <= end; i++)
    {
        if(i % 5 == 0 && i % 7 == 0)
        {
            println("BizzBuzz");
        }
        else if(i % 5 == 0)
        {
            println("Bizz");
        }
        else if(i % 7 == 0)
        {
            println("Buzz");
        }
        else
        {
            println(i);
        }
    }

}
```

Question 7 (15 points)

Write a function named `average` that takes two integers `x` and `y` as parameters and **use a loop** to compute and print the average of all integers starting at `x` and ending at `y`, inclusive. For example, `average(2,5)` should print 3.5, which equals (2+3+4+5)/4. You may assume that `x < y`.

```
void average(int x, int y)
{
    float sum = 0;
    for(int i = x; i <= y; i++)
    {
        sum += i;
    }
    float avg = sum / (y - x + 1);
    println(avg);
}
```

Question 8 (20 points)
Consider the following code segment. Fill out the table that traces the function call to `mystery`.

```
int a = 1;
int b = 2;
int c = 3;
int d = 4;

void setup() {
  d = 6;
  mystery(d);
}

void mystery(int e) {
  int f = 1;
  int result = 1;

  for (int i = 2; i < e; i++) {
    result = a + f;
    a = f;
    f = result;
  }
}
```
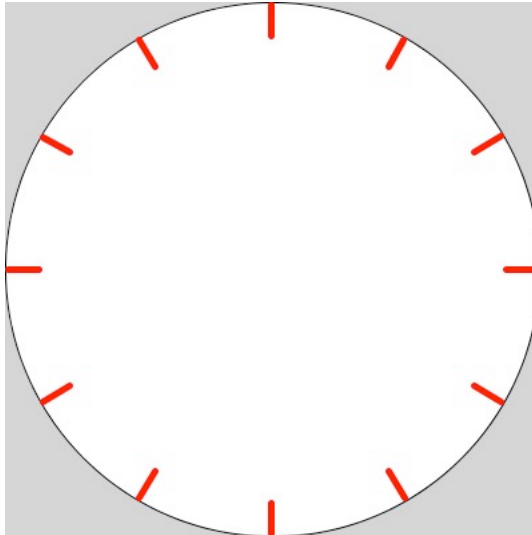
Trace of `mystery(d)`

a	e	f	result	i
1	6	1	1	2
1		2	2	3
2		3	3	4
3		5	5	5
5		8	8	

Directly after execution of the statement `mystery(d);` in `setup()`, what are the values of the following variables?

a	b	c	d
5	2	3	6

Extra Credit (20 points) Write a complete Processing program to draw a clock face as shown below on the left. Partial credit for only drawing the hour (longer) ticks as shown on the right.
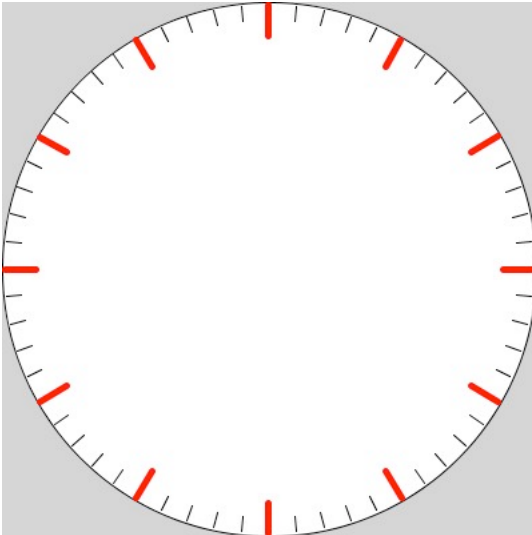

```
void setup()
{
    size(500, 500);
    translate(250, 250);
    ellipse(0, 0, width, height);

    for(int i = 0; i < 60; i++)
    {
        line(240, 0, 250, 0);
        rotate(PI / 30);
    }

    stroke(255, 0, 0);
    for(int i = 0; i < 12; i++)
    {
        line(230, 0, 250, 0);
        rotate(PI / 6);
    }
}
```

PROCESSING QUICK REFERENCE

Variables/Constants:
```
width, height, mouseX, mouseY, HALF_PI, PI, QUARTER_PI,
TWO_PI
```

Data Types
```
boolean, int, float
```

Conversion Functions
```
int(x), float(x), double(x), degrees(rad), radians(deg)
```

Relational and Logical Operators

!= (inequality)	< (less than)	<= (less than or equal to),
== (equality)	> (greater than)	>= (greater than or equal to)
! (logical NOT)	&& (logical AND)	|| (logical OR)

Loops
```
for (init; test; update) {          while (expression) {
  statements                              statements
}                                   }
```

Conditionals

```
if (test) {          if (expression) {       if (expression) {
  statements             statements              statements
}                    }                       }
                     else {                  else if (expression){
                         statements             statements
                     }                        }
                                              …
                                              else {
                                                statements
                                              }
```

2D Primitives
```
arc(x,y,width,height,startRad,endRad)
ellipse(x,y,width,height)
line(x1,y1,x2,y2)
point(x,y)
quad(x1,y1,x2,y2,x3,y3,x4,y4)
rect(x,y,width,height)
triangle(x1,y1,x2,y2,x3,y3)
text(message,x,y)
```

PROCESSING QUICK REFERENCE

Attributes
```
ellipseMode(mode), rectMode(mode)
```

Vertex
```
beginShape(), endShape(), vertex(x,y), curveVertex(x,y)
```

Mouse
```
mouseClicked(), mouseDragged(), mousePressed(),
mouseReleased(), mouseX, mouseY
```

Text Output
```
print(message), println(message)
```

Setting
```
background(r,g,b), fill(r,g,b), noFill(), noStroke(),
stroke(r,g,b)
```

Trigonometry
```
cos(rad), sin(rad), tan(rad)
```

Random
```
random(lower,upper)
```